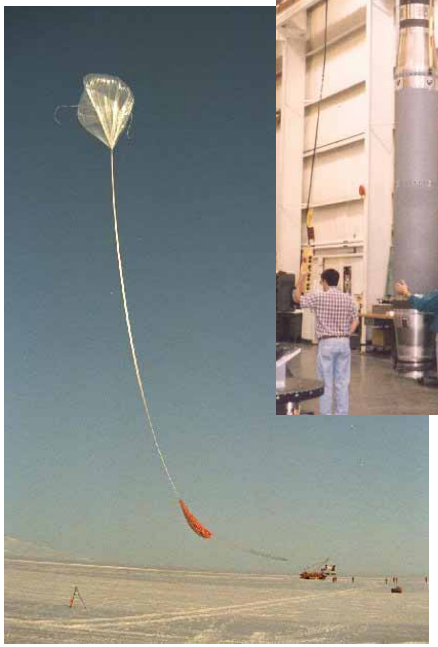
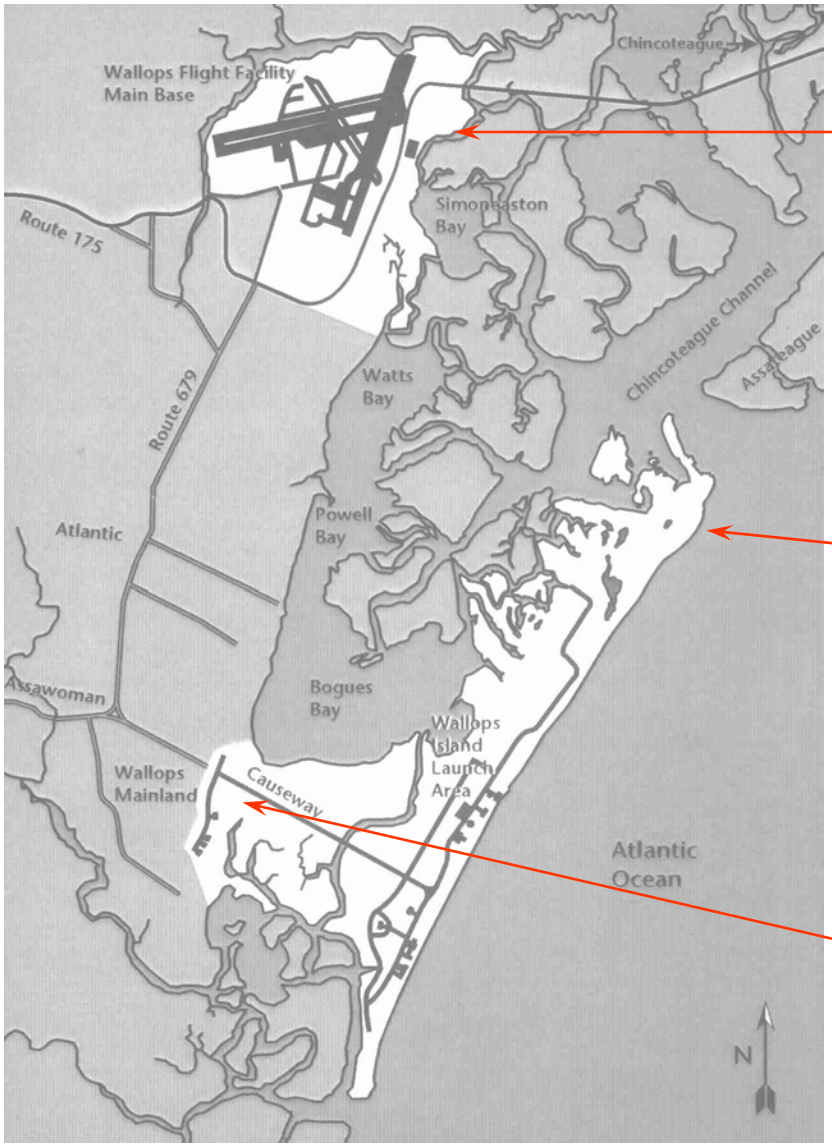


Wallops Flight Facility Overview

Wallops Flight Facility



Three Land Areas 6000 Acres

- ***Wallops Main Base 1900 Acres***
  - *Administrative & Technical Offices*
  - *Tracking & Data Acquisition*
  - *Range Control Center*
  - *Ordnance Storage/Processing*
  - *R&D, Processing Facilities*
  - *Research Airport*
  - *Navy Administration/Housing*
- ***Wallops Island 3000 Acres***
  - *Launch Sites*
  - *Blockhouses*
  - *Radar*
  - *Processing Facilities*
  - *Dynamic Spin Balance*
  - *Navy Operational Facilities*
- ***Wallops Mainland 100 Acres***
  - *Tracking & Data Acquisition*
- ***Marshland 1000 Acres***

WFF Main Base


Wallops Island

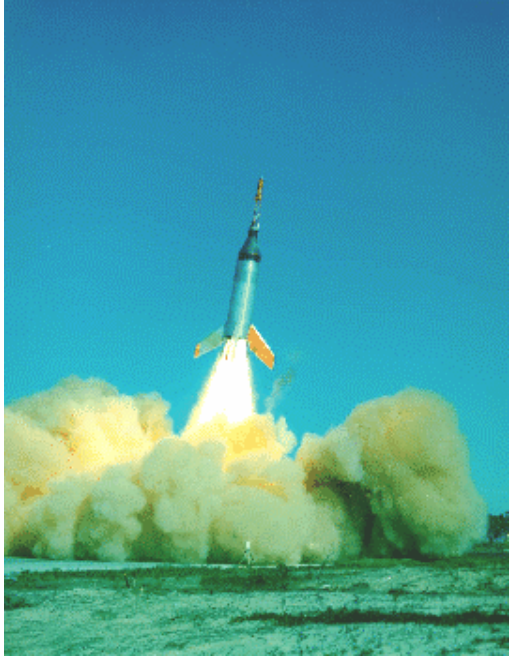
Wallops History

- Established by NACA in 1945
- Over 15,000 launches conducted

Small Animal Flight Research

"Miss Sam": Animal Physiology Research

Wallops' First Launch - Tiamat



Little Joe: Mercury Ejection System Testing

Scout Expendable Launch Vehicles

Other Wallops Organizations

Navy/Surface Combat Systems Center

Naval Air Warfare Center
(Patuxent River)

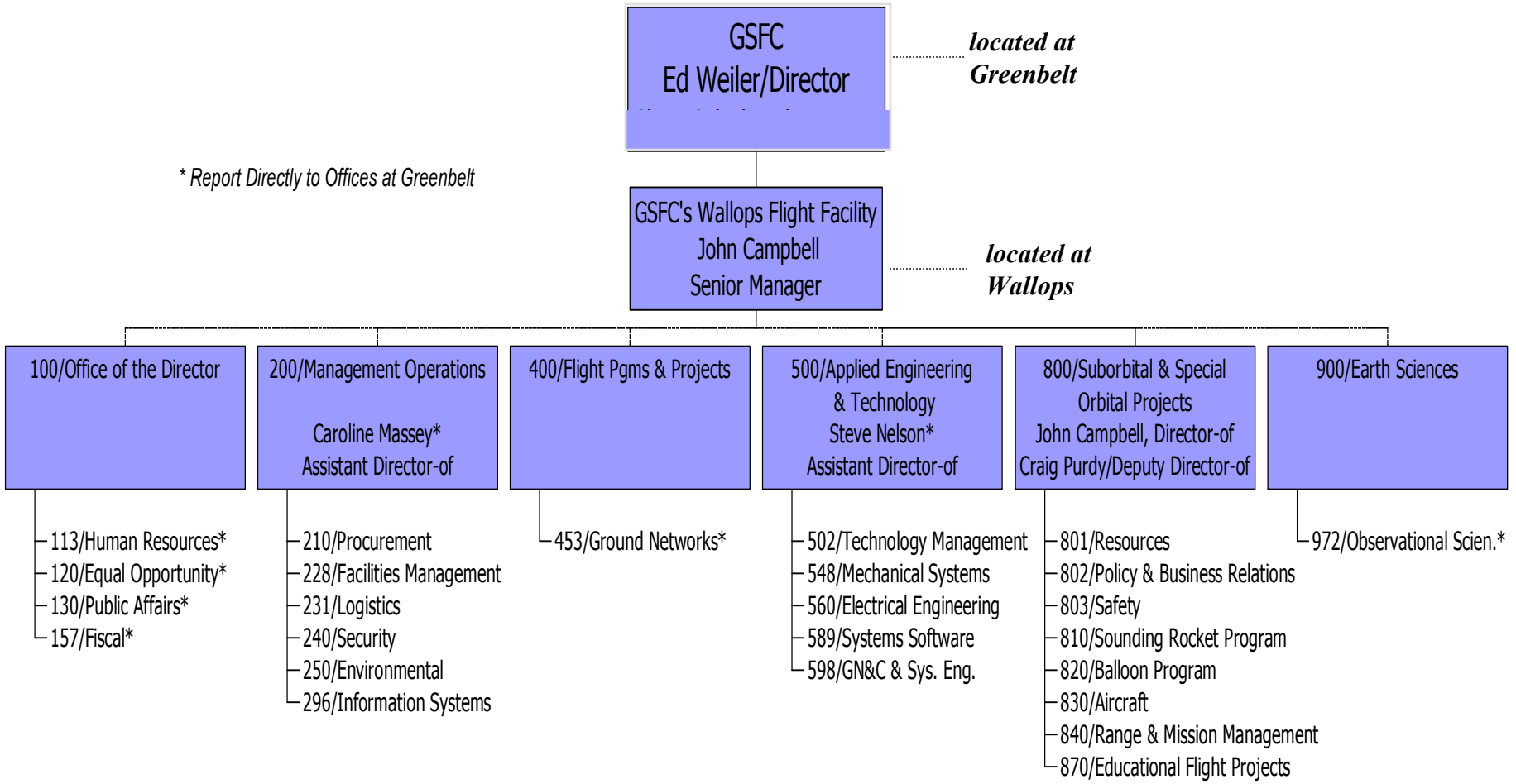
National Oceanic and
Atmospheric Administration

Virginia Commercial
Space Flight Authority

U. S. Coast Guard

Marine Sciences Consortium

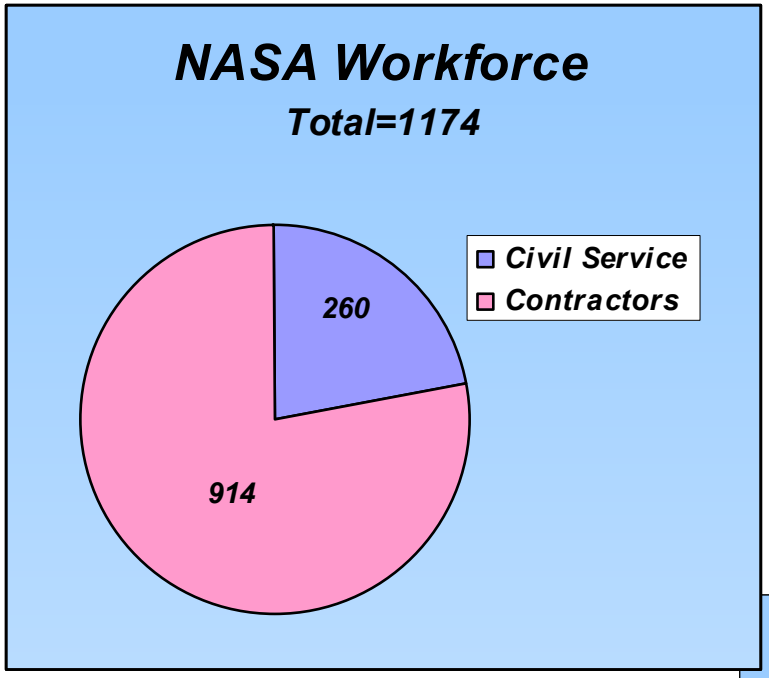
NASA/Goddard Space Flight Center
Wallops Flight Facility

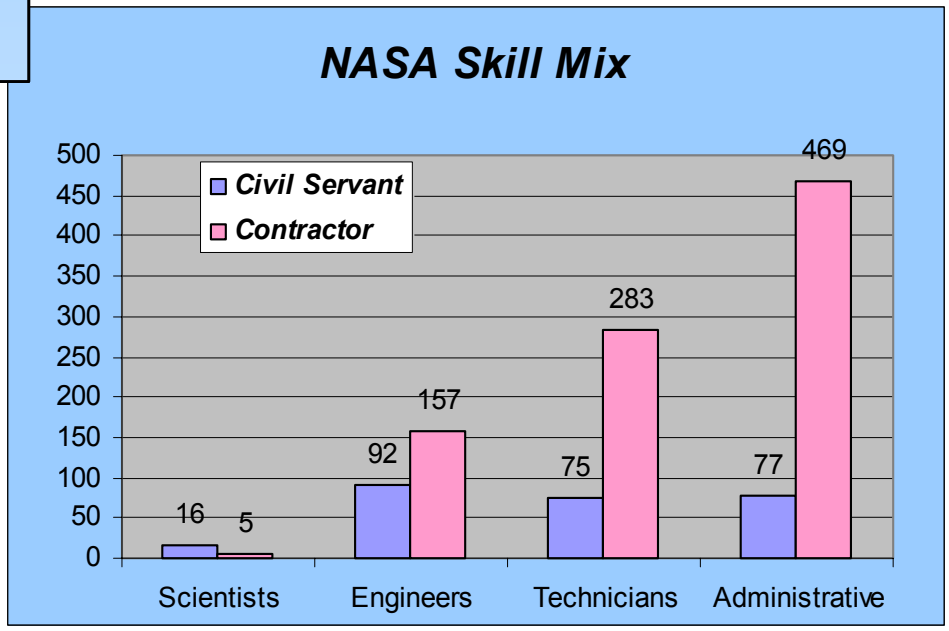


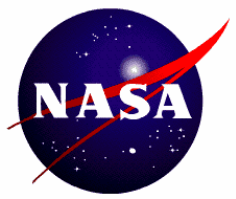
Staffing

3	61	2	89	89	16

Wallops Workforce







Goddard Space Flight Center

The Wallops Mission

Vision

Wallops Flight Facility will be a national resource for enabling low-cost aerospace-based science and technology research

Mission

- ***Enable scientific discovery***
- ***Enable aerospace technology & foster the commercial development of space***
- ***Enable education, outreach, and innovative partnerships***

Wallops Competencies

- ***People***
  - ***Leading expertise in low-cost research carriers***
  - ***Leading expertise in low-cost, quick response scientific projects***
  - ***Leading expertise in low-cost, safe, mobile range support***
  - ***Experienced in education and outreach activities***

- ***Facilities***
  - ***World-class launch range***
  - ***World-class research airport***
  - ***End-to-end (fabricate, test, refurbish) mission support for low cost, rapid turnaround of missions***

Sounding Rocket Program

Black Brant XII

Typical Spacecraft

- *Typical mission types:*
  - *Space Science research*
  - *Technology demonstrations*

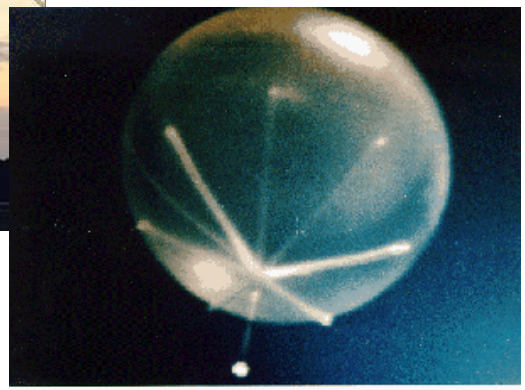
- *Features:*
  - *Apogee altitudes >1500 km*
  - *Flight times >20 minutes*
  - *Spacecraft weights >1300 lbs.*
  - *Allows quick response missions (<1 yr.)*
  - *14 launch vehicle configurations*
  - *Uses low-cost surplus military rockets*
  - *Recovery/re-use of flight hardware*

- *End-to-end in-house capabilities (design, fabrication. integration, testing, & launch operations)*

- *World-wide fixed and mobile launch sites*

Balloon Program

Balloon Inflation



Balloon at Float

Balloon Payload

Ultra-Long Duration Balloon

- **Primary mission:**
  - Space Science research
- **Features**
  - Balloon volumes up to 40M cubic ft.
  - Suspended loads up to 8000 lbs.
  - Float altitudes of 100K-160K feet
  - Mission durations up to 1 month
- **Worldwide mission operations sites**
- **Development efforts:**
  - Ultra-Long Duration Balloon (100+ day)
  - Trajectory control
  - Planetary balloons

Airborne Science Program

WFF P-3B Science Aircraft

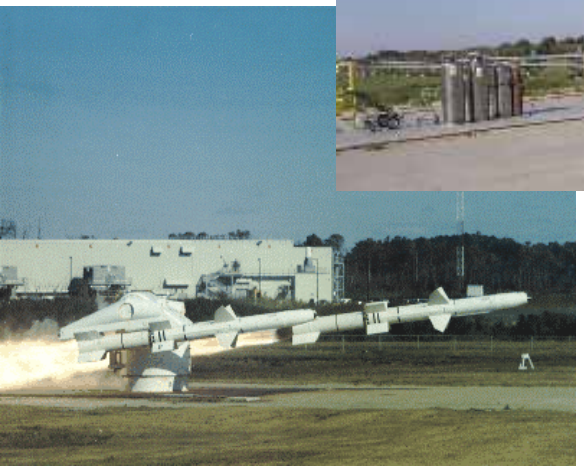
Twin Otter

Aerosonde UAV

- *Primary Mission:*
  - *Earth Science research*
- *Platforms include:*
  - *Piloted aircraft (NASA-owned & contract)*
  - *UAVs*
- *Wallops provides:*
  - *Mission management*
  - *Aircraft operations*
  - *Aircraft modifications & experiment integration*
  - *Airworthiness certification & safety*
- *Provides world-wide mission support*
- *Focus on migrating to UAVs & commercially provided aircraft*

Wallops Launch Range

Hybrid Rocket Test Flight



Vandal Target

Talos Aries

Pegasus ELV

Missions

- Suborbital & orbital science rockets
- Launch vehicle R&D testing
- Educational flight projects
- Targets & training

Supports

- NASA
- DoD
- Commercial launch industry

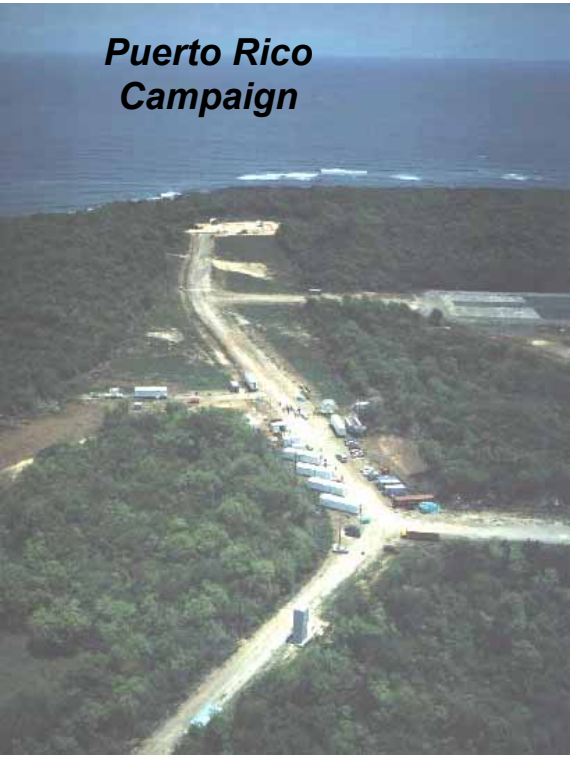
Full suite of support services

- Launchers
- Processing facilities & logistics
- Range safety
- Tracking & data services

Focus on R&D missions

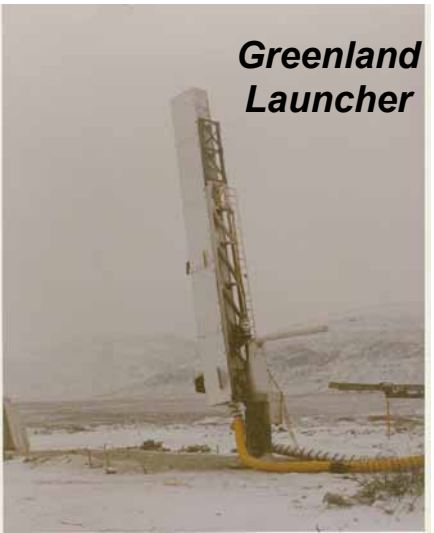
- Dynamic science events
- Developmental vehicles

Wallops Mobile Range


Puerto Rico Campaign

- Provides independent suborbital & orbital mission support at remote sites worldwide
- Typical missions
  - Sounding rocket science campaigns
  - WFF ELV downrange support
  - Mobile ELV and X-vehicle missions
- Recent Campaigns

  Kodiak Alaska, Australia, Brazil, Puerto Rico, Greenland, Kwajalein, Canary Islands


Greenland Launcher


Mobile Instrumentation

Kodiak Star Launch

Wallops Research Airport

Water Ingestion Testing

Proteus

Wake Vortex Studies

- **Primary Missions:**
  - Aircraft & airport research
  - Basing for WFF Earth Science & transient research aircraft
  - Support to WFF Launch Range
- **Runways**
  - 04/22: 8750' x 150'
  - 10/28: 8000' x 200'
  - 17/35: 4820' x 150'
  - + Island UAV Runway
- **Research Examples**
  - UAV operations
  - Aircraft & airport safety testing
  - Aircraft noise measurement
  - Landing system instrumentation demonstration
- **Features**
  - Low-traffic
  - Restricted airspace
  - Coastal location

Orbital Tracking

WFF Antenna Site

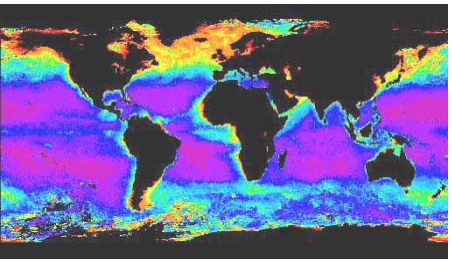
- *Critical on-orbit tracking & back-up Control Centers for NASA low-earth orbiting satellites*
  - *Spacecraft command/control*
  - *Science data receiving*
  - *24 x 7 operations*
- *Instrumentation sites*
  - *Wallops*
  - *Alaska*
  - *Norway*
  - *McMurdo Antarctica*
- *Worldwide support using transportable ground stations*

Earth Observing System Control Center

Antarctica Site

Alaska Site

Other NASA/WFF Activities



Earth Science Research

- *Global climate change research*
- *Instrument development*
- *Research laboratories*
- *Modeling*
- *Coastal zone research*

Technology Development

- *Advanced research carrier systems*
- *Next-generation mission operations*
- *Advanced mission concepts*

Safety

- *Programmatic review/approval*
- *Mission operations safety*
- *Institutional health and safety*

Education & Outreach

- *Student rocket & balloon missions*
- *VA Space Flight Academy*
- *University partnerships*
- *Cooperative education/employment programs*
- *Educator resources*
- *Visitors Center, tours, speakers, etc.*

NASA/Wallops Research Carriers

Sounding Rockets

- *20-35 missions per year*
- *Science/technology experiments*
- *World-wide launch locations*
- *Spacecraft built & tested in-house*

Scientific Aircraft

- *Atmospheric science research*
- *Flying laboratories*
- *In-house aircraft mods.*
- *Worldwide mission support*

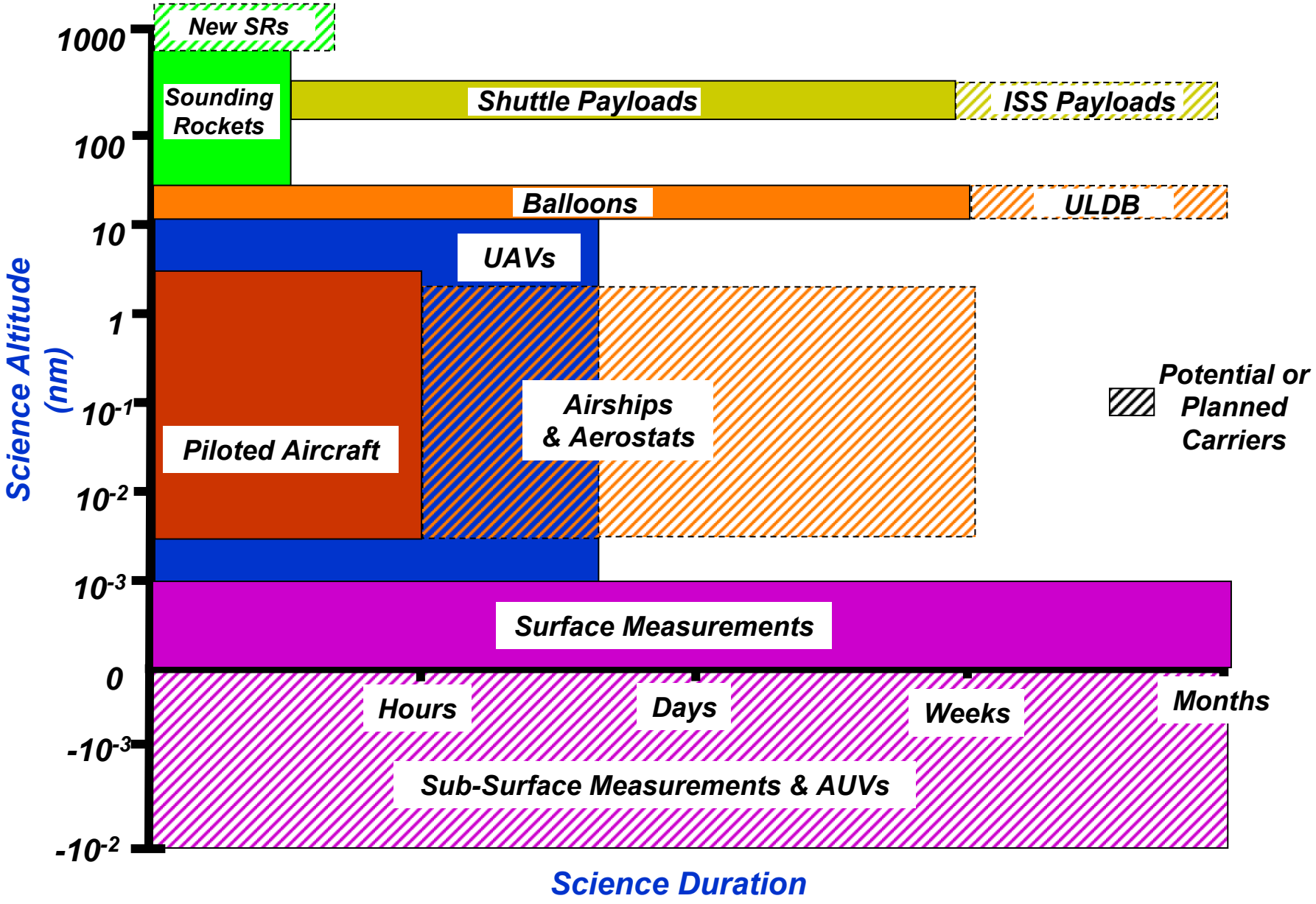
Scientific Balloons

- *20-35 missions per year*
- *Worldwide mission support*
- *Technology plans include 100+ day missions & trajectory control*

Unpiloted Aerial Vehicles

- *Earth science research*
- *Brokering services*
- *New technology developments*

Wallops Carrier Capabilities




N A S A • G S F C
WSSEB
WALLOPS SYSTEMS SOFTWARE
ENGINEERING BRANCH

Wallops Systems Software Engineering Branch

The WSSEB is ISD's engineering service provider at the WFF.

We develop integrated systems for real-time mission support, perform prototyping in collaboration with other NASA and government organizations, universities, and commercial partners, and develop testbeds to prove concepts in an operational environment. We analyze, design, test, develop, and integrate unique SW, HW, COTS, and data systems solutions to meet our customers requirements.

Capabilities

The WSSEB is a microcosm of the ISD at Wallops

- Real Time Ground and Flight Software
- Control Center & Ground System Automation
- Instrument Control Software
- Human-Computer Interface (HCI) Development
- Science and Mission Data Processing and Tools
- Knowledge Management and Engineering Tools

- Software Systems Design and Engineering
- Flight and Ground Segment Project Management
- Technology Proposals, Planning and Development
- Data, Algorithm, Software, and Systems Analysis
- Formal IT Security, SW Safety, and V&V Methods
- Project Formulation Support

Mission Set

- Adaptive Sensor Fleet (ASF)
- Advanced Range Integrated Simulation Environment (ARISE)
- Advanced Surveillance Demonstrator (ASD)
- Cosmic Ray Energetic And Mass (CREAM)
- Electro Chemical Cell (ECC) Ozonesonde
- Engineering Complex Systems (ECS) Unmanned Aerial Vehicle (UAV)
- Generic Reusable Aerospace Platform (GRASP)
- Graduate Student Information Technology Initiative (GSITI)
- Harmful Algal Bloom Spectroscopy (HABS)
- High Altitude Balloon Trajectory Control System (HABTCS)
- Instrumentation Team
- Observational Sciences Airborne Tracking (OSAT)
- Ocean Modeling Workbench
- Particulate Organic Compound (POC) Lidar Control System
- Program Offices Infusion of New Technology (POINT)
- Radar And Data Acquisition Computing (RADAC) System
- Rapid Response Range Operations (R3Ops)
- Wallop Geophysical Observatory (WGO)
- Wallops Integrated Scheduling & Documentation Management System (WISDMS)
- WFF Web Redesign
- Wind Weighting (WW)
- XML Portal for Range Safety (XPRS)

Primary Customers

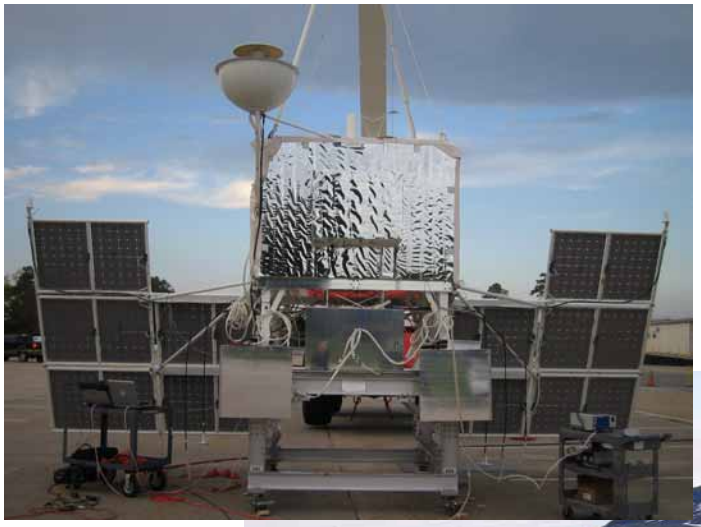
- Range and Mission Management Office - Code 840
- Balloon Program Office - Code 820
- Safety Office - Code 803
- Suborbital and Special Orbital Projects Directorate – Code 800

- Observational Sciences Branch - Code 972

- Applied Engineering and Technology Directorate – Code 500
- Information Systems Division – Code 580
- Advance Architectures & Automation Branch – Code 588
- Guidance, Navigation and Control and Mission Systems Engineering Branch – Code 598

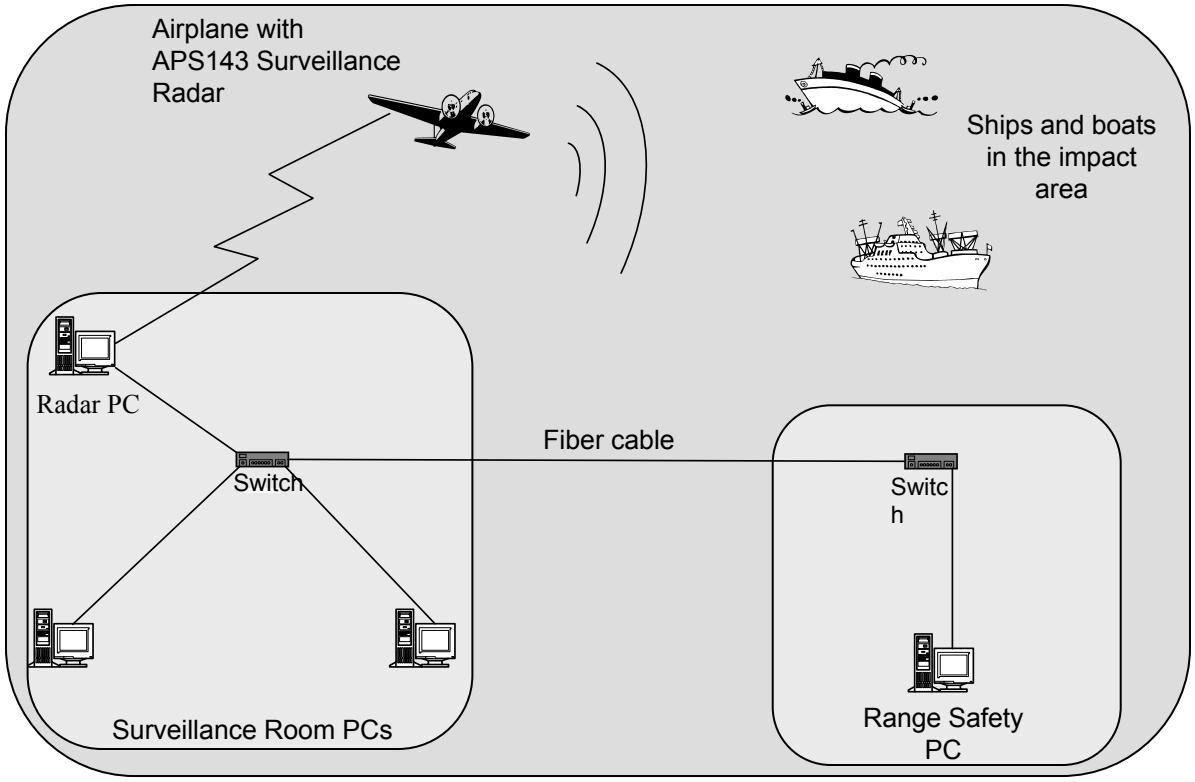
Cosmic Ray Energetics And Mass Mission

- Lead for the Command and Data Handling team, responsible for development and testing of the Flight Computer, FSW and multiple Control Centers.
- Currently supporting launch in Antarctica.
- Partnered with University of Maryland.



Wind Weighting & Ship Surveillance

- WWtng and SS are two development efforts supporting the WFF Range by increasing safety.
- WWtng predicts the winds effect on a sounding rocket launch.



- SS helps ensure that range is clear of boat traffic.

Ozonesonde Pump Efficiency System

- Developed a test-bed for the preparation and calibration of ECC Ozonesonde cells and the ECC Ozonesondes pump efficiency system.
- Will be used to calibrate instruments for flight and ground experiments.

GRASP ULDB FSW

Generic

Not specific to any vehicle or project

Reusable

Same code can be used on multiple projects

Aerospace

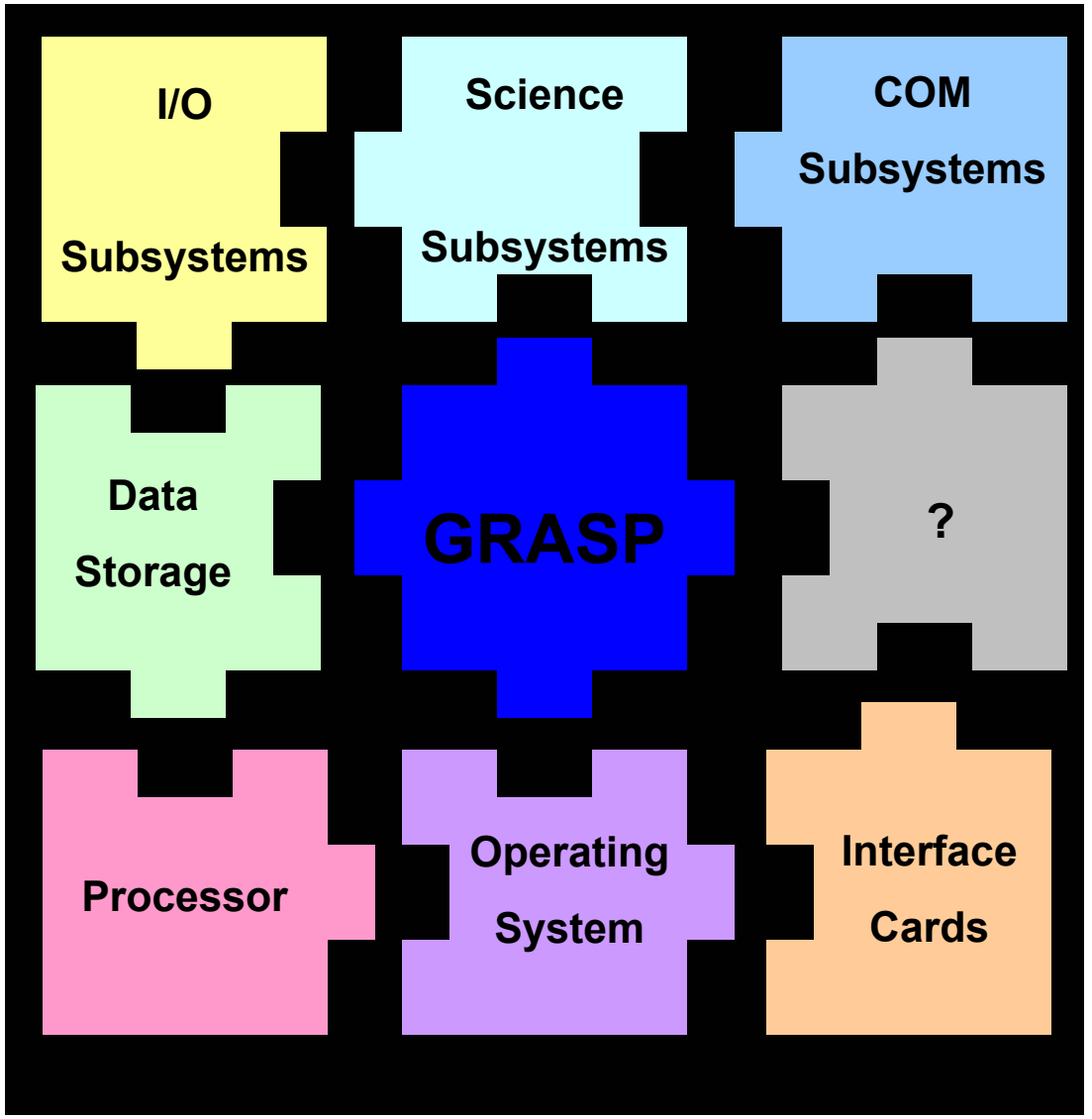
Designed for "flight software" requirements

Software

Code for libraries, processes, and templates

Platform

Provides common services to the user's code




N A S A · G S F C
WSSEB
WALLOPS SYSTEMS SOFTWARE
ENGINEERING BRANCH


NASA

Questions?